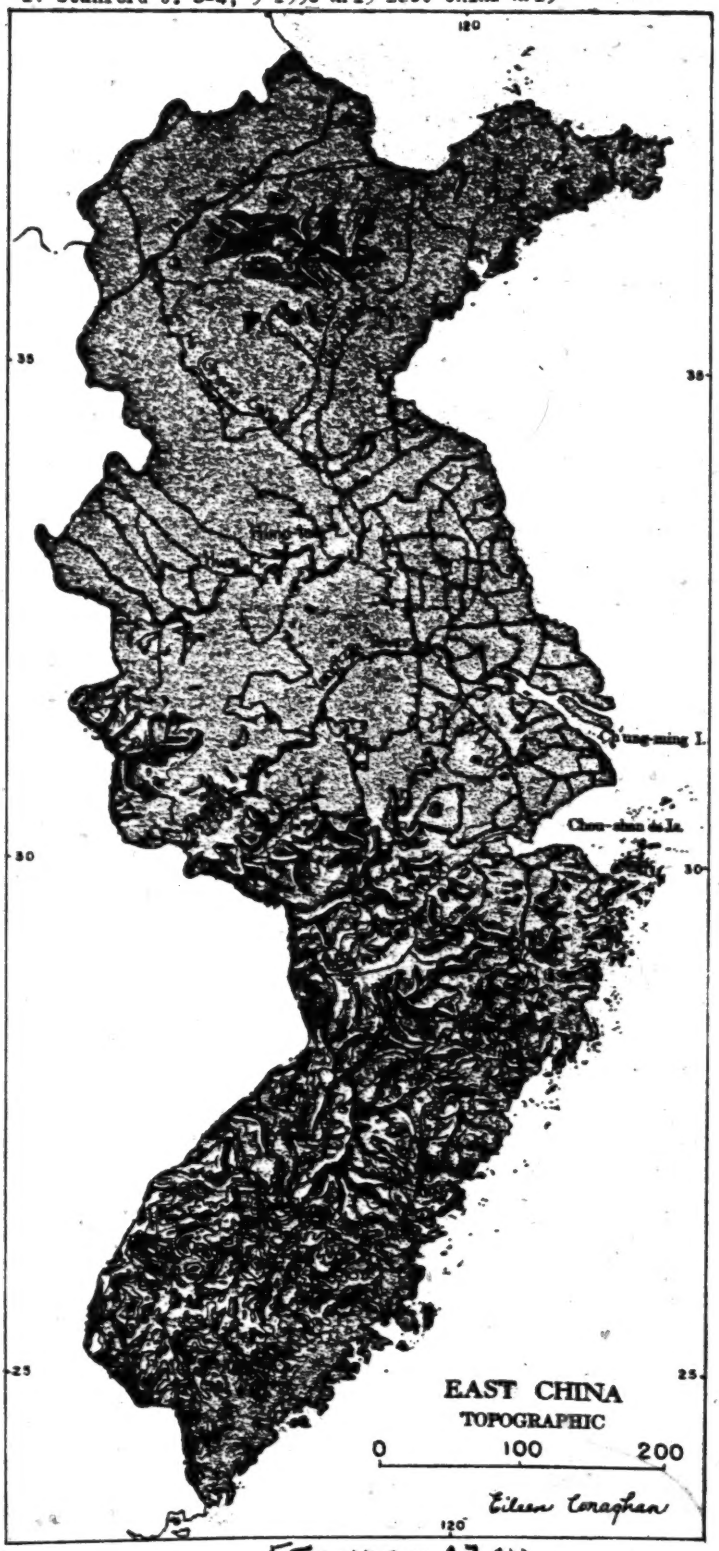
1: Stanford U. S-4, 5 1956 AF15 East China AF15

102
133.



[Facing p. 1] (b)

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

Annex "A," Subparagraph 1a,
Sociological Background
GEOGRAPHICAL SETTING

131 East China[1] lies between 27-28° North
162 latitude and 115-23° East longitude. It is composed of the provinces of Shantung, Kiangsu, Anhwei, Chekiang, and Fukien. The region covers 607,000 square kilometers (230,000 sq. mi.), or about six per cent of China's total territory, and supports 162,500,000 people, well over one-fourth of China's population. This amounts to an average of 269 persons per square kilometer (705 per sq. mi.).[2]

TOPOGRAPHY

•133 The region of East China is higher on the southwestern side, and most of the mountains cluster in the southern portion. The northern and central sections are mainly alluvial plains intersected by a network of rivers. Many of the major rivers flow through lakes and lie across the land like strings of pearls. In fact, there is such a large number of waterways flowing through the region that the sampan is the most common means of transportation.

---

1. See chapter on "Government Structure" for political subdivisions.

2. Ch'u Shao-t'ang, Hsin Chung-kuo Ti-li [The Geography of New China], Shanghai, Ta Chung-kuo t'u-shu-chü, 1953, p. 40.

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

A. Mountains and Plains

•133 From north to south, the traveler first crosses a huge mudflat through which flows the last section of the Yellow River. Not far south of the Yellow River, and in the middle of Shantung Province, rises the T'ai-shan (peak 1,545 m. or 5,000 ft.). Compared with the giant massif in Southwest China, this mountain range is insignificant. However because the surrounding plain is only about 50 meters (160 ft.) above sea level, the T'ai-shan appears to be of more imposing stature.[3] It is one of the five celebrated mountains of China and is also known as the Tung Yüeh. The fact that it is impressive has been testified to by Confucius, who, upon ascending this mountain, said, "It dwarfs the entire world." To the east of the T'ai-shan, across a land depression known as the Chiao-Huai corridor, stands the Lao-shan Range (peak 1,130 m., or 3,600 ft.), which forms the bone and frame of the Shantung Peninsula.

Mao-shan (520 m. or 1,660 ft.) is one of the few mountains in the flat Yangtze delta. Southwest of Mao-shan, on the border between

3. Chu Ch'ang-i and Chang P'ei-yü, Chung-kuo Ti-li Ta-kang [An Outline of the Geography of China], Taipei, Ta Chung-kuo t'u-shu kung-ssu, 1954, p. 83.

●133 Anhwei and Hupeh, is the Huo-shan Range, which has an average elevation of 1,000 meters (3,200 ft.). The highest peak in the region, the Huang-shan, (1,700 meters or 5,440 ft.), is located southeast of the Huo-shan. From that point southward, the land is more hilly. T'ien-mu-shan is to the east of Huang-shan. The former has peaks rising up to 1,547 meters (5,728 ft), and is an extension of the Huai-yü Range on the Anhwei-Chekiang-Kiangsi border.

The Ch'ien-tang River delta is a limited one. There are two mountain ranges south of the river, the Hsien-hsia Range on the west and the K'uo-ts'ang Range on the east, each rising 100-500 meters (320-1,600 ft.). Farther south the Wu-i Range is on the west and the Tung-kung Range on the east. The Wu-i Range (1,500 meters or 4,800 ft.) forms the boundary between Fukien and Kiangsi provinces. The Tung-kung Range is the northernmost of a series of hills covering the whole length of Fukien Province, with the Tai-yün Range immediately below it and the Liang-shan Range still farther south. These three ranges average about 800 meters (1,300 ft.) in elevation, and a few peaks rise over 1,000 meters (3,200 ft.). Again, because of Fukien's proximity to the sea, these hills look like high mountains and effectively isolate each settled area from the others.

The little flat land left in Fukien Province

•133 amounts to about five per cent of the total area, and even that is limited to the narrow strips of river valleys and the small scallop-edged fans of the delta at the river mouths. The widest of these valleys scarcely exceeds five miles.[4]

B. Rivers

133
731 The section of the Yellow River in East China has contributed immensely to the river's reputation as a troublesome and unreliable waterway: (1) it is the last of the river's capricious changes of course; (2) it has an alarming capacity for silt accumulation, about 10 centimeters per year; and (3) as it is, the bed at places is already about 2-8 meters. (6-17 ft.) above the level of its banks.[5] Under these circumstances, the river has long been a threat to the inhabitants of the area. As of early 1955, there were dikes on the lower reaches totaling 1,300 kilometers (806 mi.)

---

4. Cressey, op. cit., p. 337; Chung-hua Jen-min Kung-ho-kuo Fen-sheng Ti-t'u [The Atlas of the People's Republic of China by Provinces], Shanghai, Ti-t'u ch'u-pan-she, 1953.

5. Wang Ming-yeh, "Huang-ho liu-yü ti shui-t'u liu-shih yü shui-t'u pao-ch'ih kung-tso" ["The Erosion and Water Conservation Work in the Yellow River Area"], Ti-li Chih-shih [Geographic Knowledge], February 1955, p. 67.

133 731 in Shantung Province and in Honan Province to the west. These dikes stand 1.5-2.5 meters (3.5-8 ft.) above the highest known flood level. Another flood-diversion project, at the river mouth, has also been completed, and the Peking regime claims complete elimination of flood threat on this stretch of the Yellow River. The current is swift as it nears the ocean, and only above Lo-k'ou is it slow enough for river-junk traffic.[6]

503 Other rivers in Shantung Province are minor ones, except for the I River and the Shu River, which issue from T'ai-shan Mountain and flow southeast into Kiangsu Province. Major flood control and prevention work has been done on these two rivers. The Yün-ho [Grand Canal] connects the Yellow River with a number of small lakes and cuts southeast to reach Hangchow in Chekiang. This man-made waterway, which is divided into several sections, changes direction wherever it meets a lake or another river.[7] The section of the canal which extends from Chen-chiang in Kiangsu to Hangchow in Chekiang is navigable for small steamers all year round; north of

---

6. Ko Sui-ch'eng, Chung-kuo Ti-li Hsin-chih [New Geography of China], Shanghai, Chung-hua shu-chü, 1940, p. 67.

7. Ch'en Shih-chien, Chung-kuo Ti Ho-liu, [China's Rivers], Peking, San-lien ch'u-pan-she, 1950, pp. 67-72.

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

503 Chen-chiang the canal is shallower.[8]

933 [311] In the area between the Yellow River and the Yangtze River, the Hwai River is the main source of irrigation. The Hwai River receives water from about a dozen radiating tributaries but, curiously, has no outlet to the sea. Since 1853, when the last change in the course of the Yellow River usurped the Hwai's channel and dammed the river's flow with silt, the Hwai has emptied into land-locked Hung-tse Lake. Because the lake was gradually filling up with silt, the water during a flood ran overland and inundated thousands of acres in the vicinity.[9]

503 The North Kiangsu Main Irrigation Canal, completed by the Peking regime, helps to reliev the Hwai of its high water pressure during the flood season. On the upper reaches of the Hwai a total of sixteen reservoirs are being built to divert flood water.

133 The Yangtze River flows into this region from the west. Its width is restricted to 1 kilometer (3,280 ft.) by the Huo-shan Range as far as Chiang-yin, where it widens to over 4 kilometers (3 mi.). The entire stretch of the

8. Ch'u, Shao-t'ang, op. cit., p. 74.

9. In the 1950 flood, over 40 million mou of land were submerged; 13 million people were affected. Cf. Cheh Shin-chien, op. cit., p. 53.

•133 river is navigable in all seasons. The small lakes it traverses free the area of flood danger, and its tributaries offer extensive irrigation benefit to the entire delta. The Ch'ien-t'ang River south of the Yangtze is known for its trumpet-shaped, silt-cluttered estuary which helps raise spectacular tides when ocean waves push upriver. East of T'ung-lu a section less than 100 kilometers (62 mi.) long is navigable for small steamers.[10]

The rivers of the southeast coast below the Ch'ien-t'ang are short and swift. Their general characteristics are: (1) main streams cut through the coastal ranges and flow to the sea, forming narrow valleys with rocky beds, almost unnavigable for river traffic; (2) tributaries join the main rivers at right angles in intermountain areas where the land is open and the flow less turbulent; and (3) estuaries form potential harbors.[11] Among these rivers the larger ones are the Ou River in southern Chekiang and the Min River in central Fukien, but even the Min River, whose tributaries cover the entire northern, central, and western sections of Fukien, has too swift a current and too narrow a span to permit steamer transportation beyond a distance of 100 kilometers

10. Chu and Chang, op. cit., p. 77.
11. Cressey, op. cit., p. 335.

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

• 133 (62 mi.) from the sea coast.[12]

C. Coast

The coastline of this region is clearly divided into northern and southern halves at the Ch'ien-t'ang River estuary. In the north the line runs on the edge of low-lying delta plains, mostly sandy banks which yield few [504] harbor possibilities.[13] The only useful ports here are Wei-hai-wei, on the northern coast of the Shantung Peninsula, and Tsingtao, across the peninsula from Wei-hai-wei. The latter perches on the Chiao-chou Gulf which is a 297 square kilometer (110 sq. mi.) body of water, 60 meters (190 ft.) deep.[14] That this section of the coast is rising can be seen at the Yangtze estuary, where accumulated silt is blotting dry 1.5 kilometers (about one mile) of the ocean every sixty years, and, where an island (Ch'ung-ming) of 700 square kilometers (260 sq. mi.) has grown out of a mere sandbank in the relatively short span of 1,800 years.[15]

The southern half of the coastline is in dramatic contrast to its northern counterpart.

---

12. Ko, Sui-ch'eng, op. cit., Vol. VI, p. 167.
13. Cressey, op. cit., pp. 49-50.
14. Chu and Chang, op. cit., p. 84.
15. Ibid., p. 78.

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

•/33 Rocky inlets and offshore islands mark the shoreline and provide many potential sites for ports; in this way it resembles the coasts of Japan and New England.[16] Offshore near Chekiang, for example, there are some 1,800 islands, the most important of which is the Chou-shan (Chusan) group. The Hai-t'an, Mei-chou, Amoy, Quemoy, and Tung-shan islands off the Fukien coast merit mention although their maritime value is less significant. The ports which have been developed to various degrees are: Hsiang-shan, San-men, T'ai-chou, and Wen-chou in Chekiang; and Sansha, Fu-chou, Ch'üan-chou, and Amoy in Fukien.

CLIMATE

132 In Eastern China, north of the Yellow River, the North China plain climate prevails. Winters are extremely cold; and in summer the temperature frequently rises above 35° C. (95°F.). In the Hwai and Yangtze River area, the four seasons of the year are clearly defined and are failry equal in length. Rainfall in this area is evenly distributed throughout the year. A winter with about 11 per cent of the annual precipitation is considered normal.[17] These

16. Cressey, op. cit., p. 334.
17. Ch'u, Shao-t'ang, op. cit., pp. 75-76.

1:Stanford U. S-4, 5 1956 AF15 East China
AF15

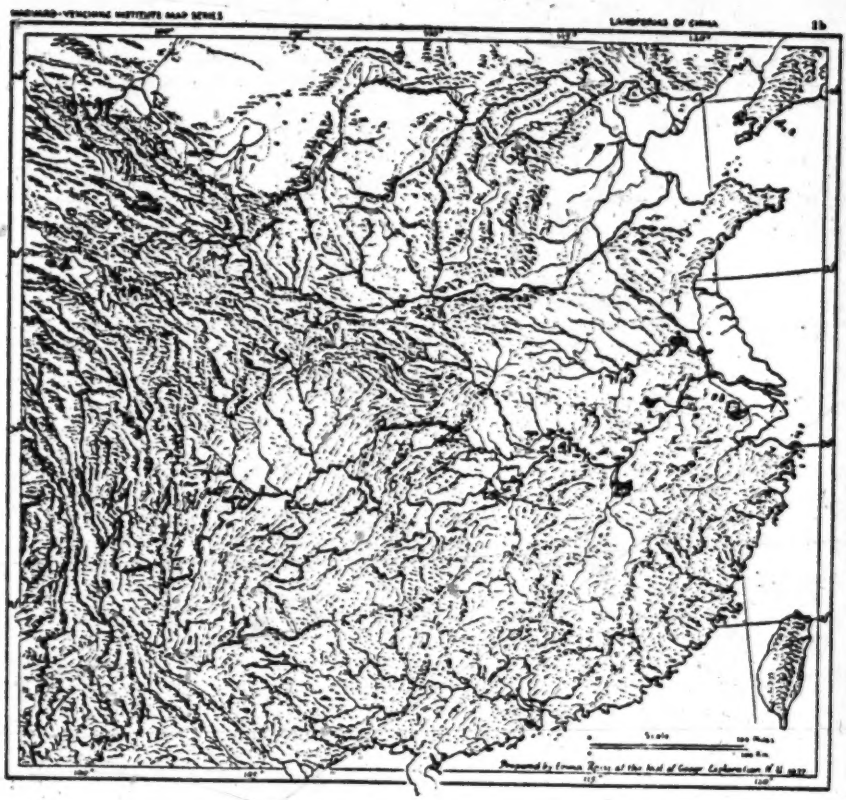
175 (c. 1520 to c. 1030 B.C.).[1] Based on the irrigated cultivation of millet, this Bronze Age civilization became the mainstream of developing Chinese culture. It spread out from the Yellow River area of the North China plain in all directions to the limits of arable land and topographical barriers, absorbing other cultures and integrating elements of them.[2]

• [133]

1. For most of the historical era the Yellow River flowed through northwestern Shantung. However, at various times and from 1324 to 1852, the river followed a course south of Shantung, emptying into the sea more than 250 miles south of the former and present river mouth. See map in Walter H. Mallory, China: Land of Famine (American Geographical Society Publication No. 6), New York, American Geographical Society, 1926, Fig. 29, p. 49.

2. On Chinese prehistory and development of the Chinese state see H. G. Creel, The Birth of China, London, Jonathan Cape, 1936; and Wolfram Eberhard, A History of China, Berkeley and Los Angeles, University of California Press, 1950, pp. 3-21. Joseph Needham, Science and Civilization in China, Vol. I, Cambridge, England, the University Press, 1954, pp. 72-99, summarizes both the foregoing presentations and other modern scholarship on China's early development.

133



Map 2. Landforms of China (reproduced here by the courtesy of the Harvard-Yenching Institute).

[p. 14]

2: Murphy G-4 (no date) 1953 AF15 East China AF15

THREE

Site

The Delta

In common with most delta ports, Shanghai has achieved its prominence in spite of the disadvantages of its site. Some indication of this may be found in the title of the first governing body set up in the city by its foreign residents in 1845: "The Committee of Roads and Jetties." The Yangtze delta, which in the vicinity of Shanghai extends westward to a low range of hills along the western shore of Tai Lake, is in process of rapid growth. 133

The delta as a whole comprises the level lowlands east of Tai Lake and of Chinkiang, and north of Hangchow; north of the Yangtze, the river's delta merges with that laid down by the Huai, and by the Huang in its several courses at different periods south of the Shantung peninsula. The delta is truncated on its seaward front, like other deltas formed on the coasts of open oceans, by coastal and tidal currents. The usual delta characteristics are present, in particular the long, relatively straight stretches of natural levee along the lower course of the river (although these are rather low and may periodically have been removed by the local farmers for grading and soil renewal), and the gradual foundering of the lower-lying areas behind the levees, in which lakes have formed.

It can be empirically assumed that the Yangtze is more silt-laden and is extending its delta faster during the last 2,000 years since the beginning of intensive farming and accompanying denudation of slopes in the river's watershed then before agricultural occupance. At Shanghai, unconsolidated alluvium covers the site to a depth averaging about 1000 feet, and the level of the almost flat plain as far west as Tai Lake is less than one foot above spring high tide in the Yangtze estuary. Calculations based on the average silt content of the Yangtze at its mouth, the velocity of the river, and the slope

[p. 29]

of the river bed indicate an average of about one foot added overall to the elevation of the bed at the river's mouth in each twenty-year period, or about one mile added to the coastline in each sixty-year period.[1]

On this basis, the site of Shanghai would have been on the seacoast about 500 B.C., an empirical estimate which agrees with the record of Chinese history. All cities in the delta area east of the line of Sungchiang (map 5) for which there are adeqaute records were founded after the third century A.D.[2] Records of the Eastern Han dynasty (25 A.D. to 220 A.D.) speak of Kunshan, now 80 miles from the sea, as the seaport of Soochow in the second century A.D., but Shanghai has served as Soochow's port since about the fifth century A.D. Tsungming Island in the Yangtze estuary, according to the official gazetteer of the island, first emerged as a habitable sand spit in the tenth century A.D. By the thirteenth century it was sufficiently densely populated to be made a separate *hsien* (county), and at present measures approximately 43 by 8 miles.[3]

Building and Drainage

The material on which Shanghai rests is thus totally unconsolidated and presents serious problems for building. An average vertical section shows silt from the surface to about 20 feet, sand to 300 feet, and gravel mixed with sand and silt to about 1000 feet, where some consolidated conglomerate is reached. The water table lies between five and eight feet below the surface of the ground.[4] It may be assumed that before the draining and filling done by the foreigners since 1843, the water table was considerably higher, and that even before 1843 the canals dug by the Chinese provided enough drainage to keep the water table lower than it would otherwise have been considering the soil and elevation of the site.

Foreigners were discouraged to find in 1875 when a bridge was built across the mouth of Soochow Creek * that one blow from the small pile driver employed buried the pilings out of sight in the

* "Soochow Creek" is the name given by foreign residents to the Woosung Chiang, originally a much larger stream, which drains into the Whangpoo at Shanghai and connects the city with Soochow, some sixty miles inland. In the interests of clarity and consistency it will hereinafter be referred to as Soochow Creek, the name by which it has most generally been known in Shanghai itself.

2: Murphy G-4 (no date) 1953 AF15 East China AF15

silt.[5] A foreign resident writing in 1915 took a gloomy view of the city's future because he considered that six storeys was the maximum possible for buildings on this site.[6] These problems have been overcome, at considerable expense, by floating the taller buildings on concrete rafts in order to provide a stable foundation adequate to support structures which would otherwise sink into the alluvium. Until the first experiment with this method in the building of the new Shanghai Club in 1910, large buildings had been set on wooden pilings driven into the silt, and great care was necessary to prevent unequal settling. Shanghai's twenty-storey hotels and public buildings, erected during the 1920's and 1930's, float on their concrete rafts in this jelly-like subsoil, a scant 800 miles from the major earthquake belt running through the Japanese islands, but fortunately in the hundred-year history of the foreign settlements, no serious shocks have occurred.

Surface drainage has also been a constant problem in the development of modern Shanghai. The original site[7] (adjoining the walled Chinese city — map 6) as the British found it in 1842 was a typical agricultural landscape of the Yangtze delta: wet rice paddies and dry cotton fields, crisscrossed by creeks and canals, and with occasional clusters of family villages. This land was subject to frequent floods at high tides by the tidal inflow of water from the Yangtze and the resultant backing up of fresh-water outlets (primarily Soochow Creek and the Whangpoo), and until recently it was still flooded nearly every year in late summer by typhoon winds from the east and accompanying heavy rains. The land within the metropolitan area was gradually raised by filling to permit the building of roads and houses. Filling was easier and cheaper than artificial drainage for all but the swampiest areas and proved adequate for the growth of the city, but it was accomplished only at a considerable expense of money and energy.

The commercial core of the city, concentrated along the Whangpoo frontage, remained regularly subject to flooding. One of the first public works projects to be carried out under the Communist administration (which has attempted to make Shanghai a showplace of efficiency as an advertisement of the virtues of the new regime) was the filling of the lowest places in this downtown area, particu-

2: Murphy G-4 (no date) 1953 AF15 East China AF15

naturally built on the outside of the bend in the Whangpoo, where tidal scour cut a channel and where it could tap a larger hinterland than on the inside of the bend. It may be assumed that the Chinese city was originally at the junction of Soochow Creek and the Whangpoo, and that since its founding in approximately the fourth century A.D., deposition and alterations in the character of both Creek and River (see the next section of this chapter) have left the city on the Whangpoo about 5000 feet upstream from the Creek's mouth. A considerable area was thus left between the city walls and the mouth of Soochow Creek, and here the British Settlement was established.

Sir Henry Pottinger, head of the British delegation at the Treaty of Nanking, selected the site for the British Settlement at Shanghai on his way back from signing the Treaty, his choice being influenced by strategic considerations.[8] The area he fixed on was the little square bounded on three sides by defensible waterways and on the fourth by the navigable Whangpoo (map 6). The main suburbs of the Chinese city lay between its wall and the Yang Ching Pang, while north of this creek the land-use was agricultural.

The boundaries of the original British leasehold of 1843 and later additions, and of the original French leasehold of 1849, made close use of existing waterways. These were useful not only for demarcation and defense, but also for sewage disposal, drainage, and transport, although not for drinking since they were both brackish and polluted. Roads (including Nanking Road) were built over many of these streams, but they continued to act as sewers. The course of Defense Creek and its junctions suggest that it was canalized for at least part of its length and diverted to supply the moat of the Chinese city, supplementing the water also received from the three other creeks emptying into the moat.

There are no contemporary accounts of natural levees anywhere on this site in 1843, and the possibility of their existence is lessened by the contemporary pattern of streams and canals as it can be reconstructed from period maps and records. Possibly the material which must have been deposited by Soochow Creek and Whangpoo flood waters along their respective banks was continually removed by local farmers in order to spread the alluvium over their fields

2: Murphy G-4 (no date) 1953 AF15 East China AF15

133 361 (a common practice in the delta), or to maintain proper ground levels for the flooding of rice paddies. It is therefore unlikely that foreign settlement was fixed in any respect by the protection or by the higher and drier ground which natural levees would have afforded.

648 A frontage on the navigable Whangpoo, completing the water defenses around the British Settlement, was an additional source of security for the foreigners, since it permitted British naval vessels to command the entire site with their guns. George Balfour, the first British consul at Shanghai, in expressing his approval of Pottinger's choice of a site, stressed the importance of the Whangpoo on this point: "By our ships our power can be seen, and if necessary, felt."[9] This consideration may have been a factor in the decision to retain the prohibition against building on the river side of the Bund, a problem which is discussed in more detail below. Certainly foreign naval vessels have been prominently anchored off the Bund at every period of Shanghai's history from 1843 until the Communist take-over in 1949.

503 Along the Whangpoo and Soochow Creek, the muddy tidal foreshore was not usable for buildings or wharves until embankments had been constructed. This process, known in all the China treaty ports by the Anglo-Indian term "bunding," was a continuing job requiring large sums of money. In the case of the famous Bund along the Whangpoo frontage of the International Settlement from Soochow Creek to the Yang Ching Pang, the terms of the original grant of lease rights by the Chinese government to British subjects prohibited building within thirty feet of the high-water mark, which space was to be reserved as a tow path for the use of Chinese trackers pulling boats upstream.

503 367 When the rights of the Chinese trackers lapsed by the mid-1850's in the face of the growing foreign stake in Shanghai and the demands of steam navigation, the Shanghai Municipal Council inherited this waterfront strip by default and successfully defended it against the designs of foreign traders who wished to make commercial use of the area for warehouses and offices which would be convenient to the river.[10] The Council undertook the bunding of this strip in 1862, and in the process extended it beyond the high-water mark to

2: Murphy G-4 (no date) 1953 AF15 East China AF15

make an overall width more than double the original thirty feet. At the northern end of this embankment, at the mouth of Soochow Creek, the Council made use of some gratuitous real estate, deposited by the Creek around the hulk of a sailing ship wrecked there in 1851, and soon made part of the mainland by continued deposition, for the establishment of a park on the river side of the Bund. A broad boulevard was built from Soochow Creek to the Yang Ching Pang along the new embankment (later extended by the French into their Settlement), and this artificially preserved freeway has been maintained by the modern city as its chief showplace and promenade ground, lined to landward by hotels, banks, trading houses, and public buildings, but on the river side by unsightly floating wharves (necessitated by the annual tidal range of 13.6 feet) and mud flats exposed at low tide.

On this problem also the Communist administration of the city have expressed themselves in another project to dress up China's modern front door to the West. The current project for the Bund (now largely completed) calls for the removal of the railway and street car lines which have run down the middle of the broad embankment, with attendant rickshaw stands and cargo stations, and their replacement by an island to be planted with grass and trees, in a reversion to the original late nineteenth century pattern. Planting is also to be added on the river side of the Bund, to provide some screen in front of the harbor functions which are too important to move, however unsightly.

Water Supply

Water for drinking and for the manifold needs of a large city has been a perennial difficulty, since the brackish Whangpoo is high in carbonates and indifferently potable, while most local wells yield an even less desirable and more limited supply. Only the relatively modest demands of most of the Chinese population and the absence of any large pure-water consuming industries make the water supply adequate for such a large city on this site.

Until 1883 all water used by the foreigners for drinking (aside from that drawn from the few local wells) was dipped from the Whangpoo or Soochow Creek (and by the Chinese from the other

2: Murphy G-4 (no date) 1953 AF15 East China AF15

creeks and canals as well) and settled in earthen jars with the help of alum to precipitate the mud. The water was then boiled and cooled, but this beverage was not held in much favor by the foreign community, and beer, wine and spirits imported from abroad filled most of the needs of at least the male foreign residents, aside from the missionaries. In 1883 a foreign-owned and directed water company under contract to the Shanghai Municipal Council began to supply water to the foreign community in pipes, and this service was gradually extended to Chinese residents of the Settlement after 1884, primarily to help prevent disease, which could so easily spread. This water, pumped from the Whangpoo, was purified by slow sand filters, alum, and chlorine, but it remained unpalatable and was distributed to less than 10,000 users in all until the turn of the century. The intake for this plant has remained on the Whangpoo below the city in south Yangtzepoo.[11]

Location downstream from the city enables the plant to draw on the tidal inflow from the Yangtze, which is less contaminated, fresher, and less muddy near the surface than what the Whangpoo brings down. The widespread use of city refuse of all kinds for fertilizing fields and for filling low-lying land makes a downstream location so near the city less of a danger than it would be in most Western cities. The Whangpoo may originally have been a tidal salt water creek which later benefitted from stream piracy in making connections with a fresh-water stream or streams farther inland as its own headwaters. Such a possibility is suggested by the Whangpoo's short total course compared with the volume of water it carries, by the sharp right-angle bend it makes in flat alluvial country about ten miles above Shanghai (map 5), and by what is known of the hydrographic history of this area, which is discussed in greater detail below.

This private British-owned company, the Shanghai Waterworks Ltd., continued to provide about half of the piped water supply of the entire city until 1936, by which time it distributed a daily average of about 54 million gallons. It was supplemented in 1903 by a company owned by the government of the French Settlement with an intake above the city on the Whangpoo, and also using sand filters, alum, and chlorine to supply a daily average of about 32 million

503 Work was begun in 1932 by the Board on cutting a channel of 33 feet at mean high tide through the Fairy Flats, which required the removal of nine feet of silt from the bar as it then existed, including an allowance of three feet for clearance in heavy seas and one foot for fall of the tide during the passage of the ship. By 1936 about three of the nine feet had been removed for half of the distance of the channel. Dredging was suspended during the Japanese occupation and has not yet been resumed during the blockade conditions of the post-war period. Much of the earlier work has thus been lost.

● [133] 502 Ebb and flow currents at Shanghai average about three knots for a total of eight hours during each 24-hour period. Six major bends in the Whangpoo (the one at the mouth of Soochow Creek being almost a hairpin turn) and the narrowness of the channel make these tidal currents a problem for ocean-going ships, both in docking and in maneuvering for anchorage. None of the ocean vessels (except for foreign warships, which usually anchored off the Bund) dock above Soochow Creek, and most of them find it easier to unload cargo onto lighters in midstream, taking on cargo at wharves 505 farther down the river in Yangtzepoo.* The wharves along the Bund are used for lighters and for river shipping. Roadsteads within the harbor are severely limited, and collisions and congestion are common.

There have been periodic suggestions that the main harbor be moved to Woosung, but even here conditions are far from ideal. There is a large anchorage in the open roads of the Yangtze with a minimum depth of 30 feet at mean low tide, measuring two miles by six miles, but tidal currents average about a knot stronger than at Shanghai, and these together with the winds across the open sweep of water prevent loading or unloading by lighter about 30 per cent of the time. Existing wharves at Woosung can accommodate only vessels drawing less than 18 feet. Cargo unloaded at Woosung by lighter or at the wharves is mainly carried to Shanghai directly by lighter on the Whangpoo, but there is also some shipment by rail.

The expense and inconvenience of transshipment would probably

* Because of the angle and direction of the tidal currents and the set of the channel, loaded ships can be maneuvered out of the wharves and down the Whangpoo more easily than up the river and into the wharves.

2: Murphy G-4 (no date) 1953 AF15 East China AF15

again. As long as water transport retains its basic place in the Chinese economy, a harbor for ocean ships will be maintained at Shanghai as the commercial center of the Yangtze basin.

Relief and Climate

The site has only two advantages of importance: it is almost completely flat, and it has a more favorable climate than rival south China ports. Ample level ground was useful during the purely commercial phase of the city's development in allowing adequate space for storage of goods, for half of China's foreign trade passed through Shanghai from 1865 on, but it was more important in allowing the development of manufacturing after 1895. The commercial center which began in an area of 43 acres along the Whangpoo in 1843, demarcated and defended by creeks, was able to grow outward toward the west, south, and north as both political and economic conditions provided the impetus for metropolitan industrial development. Level ground continues unbroken within a twenty-mile radius of the city. While the site's liability to floods is a notable disadvantage, level ground must in general be counted an asset, especially as against the lack of it in Hong Kong, Foochow, Amoy, and other south China ports.

Shanghai's climate is influenced alternately by cold dry air from inner Asia and Siberia, and by warm moist Pacific air; it is tropical for one third of the year and temperate for two thirds. Rainfall averages 45 inches annually, 14 inches of which falls in June and July, but with no very marked seasonal concentration. July and August are uncomfortably tropical, and while rains keep the temperature below 90° for at least a quarter of these two months, the relative humidity throughout this period averages 84 per cent. Temperatures rarely exceed 98°. Vital statistics for foreign residents of the China treaty ports included in the yearly medical reports published since 1870 by the Maritime Customs give Shanghai, with a death rate averaging 16 per thousand annually for the period 1870–1930, a relatively good record. Most of the foreign residents considered it among the healthier treaty ports despite its uncomfortable summer, during which as many of them as were able left the city for the central mountain belt or the Shantung beaches. The accompanying table com-

133
505

Map 4. The Yangtze River System (reproduced here by the courtesy of *The Geographical Review*). Numbers refer to: 1, regularly scheduled, all-year steamship runs; 2, waters open to all-year service by steam launches and tugs with barges; 3, waters navigable all year by large native boats; 4, waters navigable all year by small boats.

[p. 46]

2: Murphy G-4 (no date) 1953 AF15 East China AF15

Nanking is above the delta proper, and its water connections are limited compared with those of its delta rivals. It has profited primarily from its location at a break in transport routes (including China's major north-south railway, which breaks at the Yangtze — map 8), and from its periodic function as a political capital.

All three cities have been hampered in their modern development by the lack of harbors adequate for ocean ships. At Hangchow an impressive tidal bore and many shoals in Hangchow Bay preclude use of the Chientang estuary by ocean shipping, and the river itself is navigable only for small boats. Soochow, once a maritime trading center, is now effectively land-locked, and was in any case superseded as a port city by Shanghai by at least the eighteenth century A.D. Nanking, 210 miles from the sea, must contend with silting, river currents, and an exposed anchorage. Both Nanking and Hangchow are handicapped as commercial centers, especially in a region where most goods move by water, by the rugged country around them (map 5), which contrasts with the extensive lowland focused on Shanghai. While all three of these cities were larger than Shanghai before the opening of China to foreign trade and to Western commercial exploitation, they were quickly outstripped by Shanghai under the new economic conditions, where access by water to the entire Yangtze basin and to the major ocean lanes of world commerce gave it a decisive advantage.

The city lies topographically at the focus of the east China lowland, converging on it from both the west and the north, and of the Yangtze basin as a whole (map 2). The river and its tributaries, draining the productive heart of China, all feed ultimately to the mouth of the Whangpoo. In the mainly pre-industrial economy of China, the great majority of goods moving beyond purely local markets do so by water. No other location can marshall a fraction of the advantages of Shanghai on this crucial point.

Of China's two other major river systems, the Huang (Yellow) in the north is navigable for steam launches for 25 miles above its mouth and for a small part of its course through Honan, but it is otherwise useless for navigation except in short stretches by small boats. The Hsi (West) River in the south is navigable for some 230 miles in the high-water season (spring and summer) for vessels

2: Murphy G-4 (no date) 1953 AF15 East China AF15

Rival Ports

133 489 The maritime trade of south China is divided among several ports, each serving a small and well-defined hinterland outlined by mountains as separate river basins, of which the basin of the Hsi is by far the largest. The Ta Yü and Wu Yi ranges extend almost to the coast from Hong Kong north to Ningpo. Their ridges form a barrier over which very little trade passes, and the rivers which flow from their crests to the sea have cut neither easy passes across them nor extensive flood plains. The relatively short Han, Min, Wu, and Chientang Rivers, interrupted by falls and rapids over most of their courses, are navigable only for small boats, and none of them makes easy connections with other river systems. The high relief extending down to the coast, except for the few small river flood plains, makes food production as well as transport difficult. The area as a whole (southeast coastal China) must import rice, but its important exports are limited to tea and timber. The configuration of east Asia and the submerged character of the south China coastline, bring these southern ports much closer to the continental mountain mass and leave them a hinterland which is hilly, thinly populated, and unproductive compared with the Yangtze basin.

The submerged coastline of the south includes a number of good harbors, notably Foochow (the estuary of the Min River), Amoy, and Swatow, but they are too small for any volume of modern ocean shipping, and their topographically limited hinterlands do not make harbor extensions worthwhile. Railways have not yet penetrated this area, aside from the single line from Hankow to Canton, with a spur to Kowloon (the mainland adjunct to the Crown Colony of Hong Kong), a reflection of its commercial unproductiveness more than of the engineering problems which it presents.

504 The outstanding exception among south China ports is Hong Kong, possessed of the finest harbor in the Far East, a deep and well-protected roadstead between Hong Kong island and the mainland, flanked on all sides by shielding islands. Location just off the mouth of the Hsi, whose basin is the most extensive and productive lowland in south China and contains its only major transport artery, is a further advantage. The port of Hong Kong however owes its

2: Murphy G-4 (no date) 1953 AF15 East China AF15

of the trade especially of the northwest (Kansu and Shensi) and the north China plain south of the Huang moves through Shanghai.

Along the Yangtze itself, potential ports for ocean shipping must contend not only with the Fairy Flats in the Yangtze estuary, as does Shanghai, but with silting problems and river currents farther upstream. Chinkiang, at the head of the delta, has been crippled as an ocean port by silting. Nanking, where silting is an equally great problem, has relatively few water connections with its hinterland. Hankow and Kiukiang-Hukow profit from their location where major tributaries join the master stream, but their harbors are relatively small and shallow. Hankow, despite its location and the all-year channel for 5,000-ton ships from the sea, has never been an important rival of Shanghai in either foreign or domestic trade. The other Yangtze ports do not stand at notable route foci, and their harbours are equally handicapped for space and depth. Navigation on the river and within its unsheltered harbors must cope with a summer current averaging nearly five knots at Hankow and nearly four at Nanking. These confined waters are difficult and costly for deep-draft ocean shipping, especially in terms of insurance rates.

Shanghai's trade hinterland is the largest in the world. Nowhere else does a population or area of this size depend for its commercial intercourse on one master river system and one primate city. The accompanying table compares the estimated populations of China's major cities and ports in 1930.[6]

Shanghai	3,300,000	Nanchang	500,000
Peking	1,400,000	Wenchow	450,000
Tientsin	1,300,000	Tsingtao	350,000
Hankow	1,200,000	Tsinan	300,000
Canton	950,000	Amoy	250,000
Hong Kong	800,000	Ningpo	250,000
Nanking	650,000	Chinkiang	200,000
Changsha	600,000	Swatow	200,000
Chungking	600,000	Weihaiwei	200,000
Foochow	500,000	Chefoo	100,000
Soochow	500,000	Haichow	20,000
Hangchow	500,000		

C EC 94

KEY FUNCTIONS

505 The usefulness of the Yangtze system for the transport of goods is due in large measure to the number of navigable tributaries feeding the master stream, each draining its own highly productive area (maps 1 and 4). Of the major tributaries, the Kan, entering the Yangtze at Kiukiang, is navigable for steamships for 100 miles from its mouth at all seasons, and for 300 miles in summer. Both figures are exclusive of the navigation on Poyang Lake. Steam navigation on the Han from Hankow is possible for 150 miles in winter and for about 375 in summer. Junks and sampans make connections via the Han with southern Shensi. Steamships operate on the Hsiang (Siang) from its mouth in Tung Ting Lake, Hunan, for 150 miles in winter and for 250 miles in summer. On the Chialing, there is steam navigation for about 100 miles from Chungking in winter, and for 280 miles in summer. The Chialing also provides a navigable connection for sampans with southern Shensi and southeastern Kansu. On the Min, regular year-round steamship service is maintained for 80 miles from Suifu. The steamships operating on the Yangtze and its tributaries are predominantly registered in Shanghai, an indication of the extent to which the trade of the river's basin drains to the city.

C EC

505 133 These waterways of the Yangtze system were collectively the backbone of China's transport facilities in the nineteenth century, and they have remained so. Their limitations are in general those of unreliability. Stream regimens fluctuate widely through the year in all mid-latitude continental climates. In the moderately monsoonal climate of western and central China, the denuded watersheds of the Yangtze and its tributaries, where intensive agriculture has centuries ago removed most of the original forest cover, make for further seasonal extremes in stream levels. Snow melt-water from the northern and northwestern parts of the Yangtze watershed, and the rains of late spring and summer, drain rapidly into stream channels, and produce a yearly range of 90 feet in the level of the Yangtze at Ichang, and 60 feet at Hankow.

In addition, the Yangtze cuts across the major north-south mountain range of central China in its progress from the Szechuan basin to the east China lowland. Between Chungking and Ichang (the gorges of the Yangtze where it has cut through the mountains

2: Murphy G-4 (no date) 1953 AF15 East China AF15
China AF1

C EC 505 133

are between Wanhsien and Ichang), a distance of about 400 miles, there is an average drop in elevation of 14 inches per mile and a total of 15 major rapids. These gorges and rapids are responsible for the break from orthodox ocean and river steamships to special shallow-draft and high-powered steamships at Hankow, which because of its location at the mouth of the Han is a more convenient shipping and commercial center as well as a breaking-point in transport than Ichang, whose hinterland is relatively unproductive and poor in waterways. On all of the Yangtze tributaries beyond the reaches navigable by steamships, navigation by native boats is increasingly seasonal toward the headwaters, and as we have seen above, steam navigation is considerably restricted during the winter low-water period.

C EC 502

The Chinese of the Yangtze basin have learned to make maximum use of existing waterways, with the technical means available to them, and are accustomed to floating rafts and even specially designed junks on one or two feet of water.* Such rafts can carry up to 20 tons of goods and remain waterborne in one foot of water. Spring and summer floods present more of a danger for them than does the winter low-water period. In southwestern Shensi and southeastern Kansu, a region which produces wool, cotton, and hides for export, these products are sent to market during the time of the spring floods by making them up into bundles around which the hides are sewn in a waterproof covering. The bundles are then put into the headwaters of streams leading eventually into the Chialing or Han Rivers, down which they float to collecting centers near the head of junk navigation.

C EC 505

Despite such ingenious adjustments to an environment poor in easy overland routes and rich in waterways, movement of goods along many reaches of the Yangtze system virtually stops during the lowest low-water and highest flood periods, and is seriously hampered even on the master stream by currents, gorges, and rocks. Merchants of Ichang, just downstream from the main gorges of the Yangtze, estimate that about 20 per cent of east-bound boats and

* See Baron von Richtofen, *Letters to the Committee of the Shanghai Chamber of Commerce* (1871), p. 7. He describes navigation in the upper waters of Yangtze tributaries in the central mountain belt on two inches of water.